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UNITED STATES PATENT APPLICATION

of

Wendell Martens, Jeff Lonstein and Wendy Rozien

for a

MEMORY FOAM MATTRESS SYSTEM

TO THE COMMISSIONER OF PATENTS AND TRADEMARKS:

Your petitioners, **Wendell Martens, Jeff Lonstein and Wendy Rozien**, citizens of the United States, whose residence and postal mailing addresses are 8684 Hunters Creek, Clarkston, Michigan, 48348; 72 Glen Street, Westborough, Massachusetts 01581; and 107 Bradlee Ave, Swamp Scott, Massachusetts 01907, respectively, pray that letters patent may be granted to them as the inventors of a **MEMORY FOAM MATTRESS SYSTEM,** as set forth in the following specification.

MEMORY FOAM MATTRESS SYSTEM

The present application claims priority from the following United States provisional patent applications: Ser. No. 06/390,982; Ser. No. 60/390,984; and Ser. No. 60/390,985, all filed on June 22, 2002.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to mattresses. More particularly, the present invention relates to a mattress system including a viscoelastic foam mattress, an adjustable slat-type mattress support system, and an adjustable density viscoelastic foam pillow.

Related Art

It is estimated that over 100 million Americans are sleep-deprived. New research shows that sleep is the third essential component, combined with good diet and regular exercise, for a long and healthy life. Recent clinical sleep studies and research findings indicate disturbing dangers for people who short-change their daily sleep needs even a little. Sleep debt could be a factor in the national epidemics of obesity and diabetes. The lack of sleep reduces growth hormone secretion, which controls the body's proportions of fat and muscle, accelerating fatty weight gains. In a 1999 University of Chicago sleep study, healthy young men with no other risk factors developed to a pre-diabetic state after getting four hours of sleep per night for just one week.

Inadequate sleep can also weaken immune systems. Human studies show that inadequate sleep changes white blood cell counts and immune response modifiers – biological evidence that the body is having trouble fighting infection. Recent sleep deprivation studies have found that people with less sleep scored lower on tests of judgment, response time, attention, and had more mistakes than those who slept 8 hours. About half of the sleep-deprived subjects were having uncontrolled sleep attacks, in which they could not stay awake. The National Sleep Foundation attributes about 100,000 highway crashes a year to sleep deprivation. This results in an enormous loss of productivity at work as individuals struggle to remain awake. In their personal lives, lack of adequate sleep also causes increased irritability, which can place a significant strain on interpersonal relationships, especially marital and family relationships, as well as between friends, acquaintances, and coworkers.

The most often-reported cause of sleep deprivation is an uncomfortable mattress. Traditional bedding systems incorporate a mattress consisting of an outer layer of fabric and

foam padding, surrounding a series of spring coils. The fabric is stretched tightly across the foam to hold it in place, which in most cases creates a surface that is too hard. The mattress is usually supported by a flexible box spring to allow the mattress to compress where needed. However, the stiffness of the box springs causes it to push back against the mattress in the areas of greatest compression, usually the regions of the shoulders and hips. When the shoulders and hips do not sink into the mattress sufficiently, there is inadequate support for the spine, causing it to bend downward towards the mattress.

It is becoming increasingly clear that conventional mattress and box spring systems are not healthy. A standard flat mattress puts higher pressure on shoulders, hips, and thighs, which constricts the veins and disrupts cell function. Heart rate increases, the heart pumps harder to keep blood flowing, causing blood pressure to climb, thereby stressing the body. Major studies show that pressure becomes unhealthy at levels over 40mmHg (millimeters of mercury). Standard U.S. major branded mattresses put an average of 56 mmHg on weight bearing surfaces of the body. Side sleeping can place 61 mmHg pressure on the hip alone. This will cause a person to toss and turn up to 200 times a night as opposed to 20 to 40 times. The more restless a body is, the less rest it will get.

Studies also show that traditional mattresses and box springs can twist the spine by resisting the weight of the shoulders and hips, resulting in two negative consequences. First, poor support contorts the back and body, resulting in bone and muscle stress, increasing discomfort, and interrupting sleep patterns. Second, this creates pressure points that impair circulation, which increase heart rate and blood pressure. These changes combined with the discomfort from the pressure points results in poor sleep.

The human spine at rest has a different shape depending on the orientation from which it is viewed. Viewed from the back, the spine should appear essentially straight. Viewed from the side, the spine has an S-curved shape. When the spine is bent out of its natural orientation for long periods of time, the result is back pain and discomfort. Most people sleep on conventional mattresses that have a tendency to do just that – contorting their spines out of the comfortable range every night, producing symptoms ranging from mild discomfort to severe back pain. For an individual lying on their side, this causes the spine to bend laterally out of the preferred orientation, thus curving the normally straight spine as seen from the back. For an individual lying on their back, this causes the spine to sag downwards out of the preferred orientation, thus straightening the normally curved spine, particularly toward the small of the back, as seen from the side.

Changing the stiffness and the number of spring coils in the mattress can alleviate this problem to some degree. However, the optimal stiffness of the coils should be different depending on body type and weight. Traditionally, U.S. bedding manufacturers tend to ignore body types and weight, and market sleep systems constructed under the inaccurate assumption that 95% of the population has the same body type.

One attempt to provide a mattress that can contour itself to the shape of the body in such a way as to keep the spine in a more neutral alignment uses a mattress consisting of a soft core layer of polyurethane foam, topped with a layer of viscoelastic foam. An example of this type of construction is the Tempur-Pedic® mattress. Viscoelastic foam is an open-celled material that is temperature and weight sensitive, becoming more soft and pliable with increases in temperature. Viscoelastic foam conforms to the body shape due to a combination of weight distribution and the increase in temperature associated with body contact. As the position of the body changes, the viscoelastic foam adjusts to the resulting shape. It is thought that because the viscoelastic material compresses to a greater extent in areas around the shoulders and hips where body temperature and weight are the highest, the spine will be supported, thus decreasing back pain. In reality, a large number of these mattresses are routinely returned to their sellers because they actually cause increased discomfort and back pain, suggesting that they do not support the spine in the optimal position when a user is lying on their side or back.

Another possible approach to providing better sleep support is to modify the box spring. One such approach is to use a slat-type mattress support instead of a box spring. This type of mattress support utilizes a system of transverse wooden slats attached across a perimeter frame, upon which the mattress sits. Some of these slat-type systems include multiple pairs of slats attached to the frame, with some of the pairs being adjustable. The adjustable pairs of slats correspond to various regions of the body from the knees to the middle of the back. One problem with prior slat systems pertains to individuals with unusual body proportions, such as a person with very large shoulders or a person with a very small waist and wide hips. There is generally not enough flexibility or adjustability in the slats of prior systems to accommodate these people. Similarly, existing slat systems generally do not provide adjustability for the shoulders, a region of the body that is important in maintaining proper spinal alignment.

The range of motion of the neck also makes it very susceptible to harm, including harm from an improper sleeping position. Slouching without proper support can triple the weight load on the neck, often causing soreness, stiffness, and eventually pain throughout the night. Soreness, stiffness and pain are body signals that harm is being done to the upper spine. This

hinders sleep patterns, resulting in morning fatigue, headaches, and stiffness of the neck and shoulders, and eventually possible spinal disc damage.

Traditional rectangular pillows, consisting of an outer layer of fabric or plastic surrounding a soft core of feathers, soft foam pieces, or other similar material, tend to lose their ability to support the head and neck soon after a body lies on them. To compensate, sleepers frequently place their arm under their pillow or head while sleeping to make up for lost support. Sleeping in this position "shrugs" the shoulders up. To compensate, the sleeper, is forced to round their back, stressing the back and neck, making pain in the morning more likely.

Depending on the core material, these pillows can have a wide range of compressible and elastic properties. Pillows made from feathers or down are softer and compress more easily, thus providing little or no support to the cervical curve, a property that worsens over time with use. Pillows with foam chips are very elastic, but do not compress as readily. When lying on one's back, the head will tend to be rotated too far forward, relative to the spine, with a foam core pillow, and too far back with a feather pillow. When lying on one's side, the head will tend to be rotated toward the bed with a soft feather core pillow, and away from the bed with a foam core pillow. The result of both of these situations is that the head is rotated out of its optimal cervical alignment with the spine, thus placing strain on the neck, creating an uncomfortable sleep environment and eventually damaging the cervical curve of the neck.

Another important issue related to head and neck support concerns the asymmetries associated with lying in the different positions. Because of the shape and orientation of the head relative to the shoulders, the area required for optimal support while lying on the side is different from what is required when lying on the back. In other words, the curvature and space under the back of the head and neck when lying on one's back are small compared to the corresponding distance from the end of the shoulder to the underside of the head and neck when lying on one's side.

One attempt to solve this problem provides a pillow with a contoured top. Such pillows have asymmetrical, semicylindrical ridges in a contoured top, a large one for lying on the side, and a smaller one for lying on the back. Some pillows of this type are made from viscoelastic or "memory" foam, surrounded by a cover material. The viscoelastic foam conforms to the head and neck shape due to a combination of weight distribution and the increase in temperature associated with body contact. As the position of the head and neck changes, the viscoelastic foam adjusts to the resulting shape. It is thought that the combined effects of the contoured ridges and the shape-conforming properties of the viscoelastic foam would provide good support

for the head and neck, thus maintaining neck-spine alignment. It is hoped that this would decrease neck discomfort and allow a more comfortable and restful sleep.

In reality these pillows do not adequately support the head and neck for different body shapes, such as broader shoulders, resulting in increased neck discomfort for different body shapes. Also, as the viscoelastic foam conforms to the head and neck, it begins to trap body heat. This makes the foam more pliable, causing the head and neck to continue to sink into the pillow, ultimately reducing support for the cervical curve, similar to a feather core pillow. In addition, most viscoelastic foam contour pillows in the market are affected by room temperature, which can adversely affect the hardness of the pillow, particularly as temperature decreases. This can create pressure points that can result in contortion of the neck and additional neck pain.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a mattress system that keeps the spine properly supported regardless of the body shape or weight of the user.

Another object of the invention is to provide a mattress system that allows the spine to remain in a more neutral position for both side and back sleepers.

Another object of the invention is to provide a mattress system that is adjustable for individual body shapes, reduces blood circulation restriction, minimizes the telegraphing of motion, and reduces pressure points on the shoulders and hips.

Another object of the present invention is to provide a mattress and/or pillow that is not significantly affected by the surrounding room temperature.

An object of the present invention is to provide a pillow that adequately supports the head and neck when lying on the back or the side.

Another object of the present invention is to provide a pillow with adjustable firmness for different body shapes.

In accordance with one aspect thereof, the invention provides a mattress system, comprising a mattress, including a core layer providing a base support, and a top layer of viscoelastic foam, disposed atop the core layer, having a density of from about 3.0 to about 4.5 lb/ft^3.

In accordance with a more detailed embodiment thereof, the core layer may comprise foam material having a density of from about 2.5 to about 2.7 lb/ft^3.

In accordance with another aspect thereof, the invention provides a mattress, comprising a core layer of foam material, having a core density primarily configured to support a human body, and a top layer of viscoelastic foam, disposed atop the core layer. The top layer has a

composition that maintains substantially uniform viscoelastic response over a room temperature range of from about 55° F to about 85° F.

In another embodiment, the invention provides a mattress support system, comprising a perimeter frame, with a plurality of pairs of slats spanning the width of the frame and attached to the frame by suspension clips. The plurality of pairs of slats include nonadjustable pairs and adjustable pairs. A support slat is disposed beneath each pair of adjustable slats. A total of 7 pairs of adjustable slats span the regions from the shoulder to the knees of an individual lying on a mattress atop the mattress support. Each stiffener slat is connected to a corresponding adjustable pair of slats by an adjustment clip, such that sliding the adjustment clip along the length of the adjustable pair of slats changes the stiffness of the adjustable pair of slats, thereby adjusting the stiffness of the mattress support in each of seven regions between the shoulders and hips.

In accordance with another aspect thereof, the invention provides a pillow, comprising a viscoelastic foam body with a contoured top and a flat bottom. Advantageously, the viscoelastic foam material is configured to provide a substantially uniform viscoelastic response over a room temperature range of from about 55° F to about 85° F. The contoured top has two support ridges, a large one for supporting the head and neck when lying on one's side, and a small one for supporting the head and small of the neck when lying on one's back. Within the support ridges are two insert pockets. Foam inserts are disposed in the insert pockets, so as to support the viscoelastic foam in the support ridges. Different density foam inserts can be disposed into the insert pockets to adjust the firmness. The viscoelastic foam and the inserts are surrounded by a cover with an opening to access the inserts.

Additional features and advantages of the invention will be apparent from the detailed description which follows, taken in conjunction with the accompanying drawings, which together illustrate, by way of example, features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view of a memory foam mattress in accordance with an embodiment of the present invention.

FIG. 2 is a perspective view of a mattress support system in accordance with an embodiment of the present invention.

FIG. 3 is a cross-sectional view of the mattress support system with a viscoelastic mattress in accordance with an embodiment of the present invention.

FIG. 4 is a cross-sectional view of a pair of adjustable slats, a stiffener slat and an adjustment clip.

FIG. 5 is a side view of an individual lying on a viscoelastic mattress and mattress support.

FIG. 6 is a perspective view of a pillow in accordance with an embodiment of the present invention;

FIG. 7 is a cross-sectional view of the pillow of FIG. 1;

FIG. 8 shows a perspective view of the spine curvature for a person lying on their back; and

FIG. 9 shows a perspective view of the spine for a person lying on their side.

DETAILED DESCRIPTION

Reference will now be made to the exemplary embodiments illustrated in the drawings, and specific language will be used herein to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended. Alterations and further modifications of the inventive features illustrated herein, and additional applications of the principles of the inventions as illustrated herein, which would occur to one skilled in the relevant art and having possession of this disclosure, are to be considered within the scope of the invention.

One of the major problems in the prior art concerns the tendency for a viscoelastic mattress to allow the spine to sag downward. Viscoelastic foam mattresses typically use a soft polyurethane core layer having a density of about 1.8 lb/ft^3, to support a 5 lb/ft^3 viscoelastic layer. It is thought that this combination of materials can adequately support the spine, create comfortable sleeping conditions, and decrease the occurrence of mattress-related back pain. In reality, the inventors believe that the combination of a relatively soft core layer with a relatively dense viscoelastic layer actually causes increased discomfort and back pain, because it does not adequately support the spine. The lack of support causes the spine to straighten (as seen from the side) from its naturally curved shape when an individual lies on their back, or to curve (as seen from the back) from its naturally straight shape when the individual lies on their side.

This problem is compounded by the temperature sensitivity of the top layer of viscoelastic material. As the shoulders and hips press down they trap heat in the layer. This increase in temperature causes the material to become softer, thus causing even greater compression. In addition to compounding the crooked spine problem, the increased heat can become uncomfortable and interrupt sleep.

To address these problems, most makers of viscoelastic foam mattresses have gone to a denser viscoelastic foam top with a softer polyurethane core. The inventors believe this approach is the opposite of what is needed. To address some of the failings of prior mattresses, the inventors have invented a mattress comprising a core layer with a greater density than the prior art, combined with a viscoelastic top layer with a lower density than the prior art.

As shown in Fig 1, the present invention provides a mattress 10 comprising a top layer of viscoelastic foam 12, and a core layer 14. The preferred viscoelastic foam layer ranges in density from about 3 to about 4.5 lb/ft^3 and can be from about 2 to about 4 inches thick. In one embodiment of the invention, the viscoelastic foam layer is about 4 lb/ft^3 in density and is about 3" thick. A suitable material having these properties is the 3510 viscoelastic foam available from Domfoam International, Inc. of Quebec, Canada. This material has a density that typically ranges from about 3.5 to 4.0 lb/ft^3. The core layer is preferably polyurethane foam, about 3 to 7 inches thick, with a density of about 2.5 ± 5% lb/ft^3 (2.3 to 2.7 lb/ft^3), or any other material or material combination with similar compression properties. For example, the core layer can be polyurethane foam, latex foam, or a combination of polyurethane and latex foams. Additionally, spring coils, a honeycomb spring structure, or any other material providing similar support characteristics could be used for the core layer. In one embodiment, the core layer consists of about a 5" layer of high resilient polyurethane foam with a density of about 2.5 lbs/ft^3. The viscoelastic layer 12 and the core layer 14 are attached together with a chemical adhesive, such as a clean hot melt glue, and surrounded by a cover 16 to protect the mattress. Other adhesives could also be used, such as water based glues, latex bases glues, and ethylene chloride based glues. The cover is removable, and includes a zipper 18 for allowing removal from the mattress, such as to facilitate washing, etc. In one embodiment, the cover is quilted terry cloth made of a cotton/polyester blend. Alternatively, the cover could be made of cotton stretch fabric. It will be apparent that quilting is optional. Moreover, the cover could be permanently attached to the mattress, such as by sewing or with an adhesive, rather than being removable. The cover can also include such additions as an anti-microbial treatment and a breathable liquid barrier inner lining.

The lower density viscoelastic layer compresses to a greater extent than the higher density viscoelastic foam of the prior art. This effect, coupled with the reduced compressibility of the denser polyurethane core layer, provides greater spine support as the shoulders and hips sink into the combination of materials. This results in the spine being supported more closely to its optimally curved orientation when lying on the back, and its optimally laterally straight

orientation when lying on the side. In addition, the lower density viscoelastic foam is not as affected by temperatures in the range of the body.

One common problem of viscoelastic mattresses is the sensitivity of the mattress to the surrounding ambient temperature. With other viscoelastic materials, the mattress is more sensitive to temperature changes. The colder the room temperature, the harder the mattress becomes. For example, other viscoelastic mattresses become quite hard and unpliable at temperatures at or below about 65° F. Indeed, at temperatures below about 50° F the denser viscoelastic foam of the Tempur-Pedic® mattress can actually break if one attempts to bend it. As another example, Serta produces a mattress with a viscoelastic foam having a density of about 2.5 lb/ft^3 that becomes noticeably hard at temperatures below 65° F. Consequently, some producers of these mattresses insist that the user must maintain a specific room temperature (e.g. 71° F) for the mattress to function properly.

Advantageously, the firmness and consistency of the mattress of the present invention is more consistent over a wider variety of temperatures, providing a more consistent level of support and comfort, regardless of room temperature. Specifically, the inventors have found that the 3510 viscoelastic foam mentioned above remains substantially moldable and pliable at temperatures as low as 30° F, and starts to become noticeably former at temperatures close to 0° F and below. More particularly, this foam material has a density that is preferably in the range of from about 3.5 to about 3.8 lb/ft^3 (though the density can vary up to about 4 lb/ft^3), and exhibits an indentation deflection force (IDF) of 10 ±3 (i.e. an IDF range of 7-13). Indentation deflection force is a standard measure used in the foam industry to measure the strength of foam materials. The IDF measures the pressure (e.g. in psi) required to depress and hold a flat metal plate of a standard size (e.g. 12" square) a certain distance (e.g. ½") into the surface of a foam material. The inventors have found that for the 3510 viscoealstic foam the variation in IDF over a temperature range of from about 30° F to 100° F is less than about 15%. Within the range of typical room temperatures (e.g. from about 60° F to about 85° F) the variation is much less. Thus, within the range of likely room temperatures, the moldability and viscoelastic response of the present mattress is substantially constant, and any variation over this temperature range is substantially unnoticeable to an ordinary user.

The temperature insensitivity of this viscoelastic material was an unexpected result. Specifically, this viscoelastic material was apparently not developed with the intent of reducing temperature sensitivity. The producers of the material did not recognize this property, and did not recognize its suitability to bedding applications. However, after selecting this material for use in the invention, the inventors discovered this property and recognized its advantages.

People with back trouble fall along a continuum from mild discomfort to severe back pain. Those individuals that have severe back problems have a very difficult time finding a comfortable mattress. With the mattress of the present invention, the inventors have found that most individuals with severe back problems that tried the mattress experienced improved sleeping. What was surprising, however, was that this mattress also helped others to sleep better, not just those with back problems.

There are a variety of different types of mattress support systems, including platform systems, box springs, electric adjustable frames, and slat-type supports. Conventional mattresses are not equally compatible with each of these types of systems, and present various drawbacks when used with each of them, such as producing pressure points and contorting the spine. Advantageously, the viscoelastic mattress disclosed above is compatible with all of these types of systems by reducing pressure points and giving greater support for the spine. For greater support and adjustability, the present invention advantageously provides an improved adjustable slat-type mattress support system. Traditional slat support systems generally do not provide a region of adjustability to differentially support the shoulders. Additionally, individuals with extreme body proportions may derive little benefit from conventional slat systems because the range of adjustability of the slats may not encompass a range including their body type. Advantageously, the inventors have developed a bedding system that provides adequate adjustability to support the shoulders, and an increased range of flexibility to allow adequate alignment of the spine for those individuals with extreme body proportions.

Typical adjustable slat support systems incorporate up to 6 pairs of adjustable slats, corresponding to regions of the body from the thighs to the upper region of the back. A stiffener slat is disposed beneath each of the adjustable pairs and attached by a pair of adjustor clips. The adjustor clips can be slid from one end of the adjustable pair to the other to alter the stiffness of the slats in that region. When the adjustor clips are at opposite ends of the slats (i.e. toward the perimeter frame), the stiffener slat has little effect on the adjustable pair. As the adjustor clips are moved toward the center, the adjustable pair of slats is increasingly stiffened due to the added support of the stiffener slat. As a result, the overlying mattress will have areas of differential support that can be adjusted to match the weight distribution and shape of an individual.

Unfortunately, typical slat-type support systems do not provide adjustability for the shoulders. The inventors have discovered that a mattress support with a 7th pair of adjustable slats positioned under the shoulders improves spinal support. Further, the inventors have discovered that using a viscoelastic foam mattress, such as that described above, atop this

mattress support provides a combination of the differential flexibility of the slats and the body conforming properties of the viscoelastic mattress. This creates a bedding system that provides better support and comfort for many individuals, including those with extreme body proportions or back trouble. By replacing the uniform stiffness of box springs with a system that is capable of providing varying degrees of support to critical pressure zones of the neck, shoulders, chest, waist, hips and knees, pressure is more evenly distributed and the stressors that disturb sleep are reduced.

In one embodiment shown in FIG. 2, the invention provides a slat-type mattress support 20 having a perimeter frame 22 and a plurality of slats, including nonadjustable slats 24 and adjustable slats 26, spanning the width of the frame. The slats are attached to the frame (singly or in pairs) by resilient connectors (31 in FIG. 3), such as suspension clips. The suspension clips allow the slats to move down and rotate slightly in response to weight from above. In the embodiment shown in FIG. 2 there are approximately 13 pairs of slats, though exact number may vary, particularly for tall individuals (e.g. those over 6'3" tall). The adjustable slats include 6 pairs of middle adjustable slats 29 (positioned from the knees to the middle of the back) and a seventh pair of shoulder support slats 27. One stiffener slat 32 is disposed beneath each of the seven pairs of "adjustable" slats corresponding to regions of the body from the knees to the shoulders.

The stiffener slats 32 are each attached to a corresponding adjustable pair of slats 26 with an adjustment clip 28. FIG. 3 shows the orientation of the stiffener slat 32 in a side view, and FIG. 4 shows its orientation in a cross-sectional view. The location of the adjustment clips 28 relative to the ends of the adjustable pair of slats determines the flexibility of that region of the mattress support system. When the adjustment clips are located near the outer edges of the perimeter frame, the adjustable slats are more flexible. When the adjustment clips are located near the middle, the adjustable slats are more stiff, due to the added support of the stiffener slat. FIG. 4 shows a cross-sectional view of an adjustable pair of slats 26, a stiffener slat 32, and the adjustment clip 28. Also shown is a nonadjustable slat 34. The stiffness of the nonadjustable slats remains constant, while the stiffness of the adjustable slats is augmented by the adjustment clips, which press against the stiffener slat.

When an individual uses this mattress support system 20, the degree of support of the mattress can be selectively adjusted to suit the body shape and weight distribution of that individual. For bed sizes large enough to sleep two individuals, each side may be adjusted independently, to provide the ideal spinal support for each user. In this embodiment of the

invention, a center support 30 longitudinally bisects the perimeter frame 22 into two functional mattress supports, each with its own set of slats 24, 26 and adjustment clips 28.

One great advantage of this slat-type support system 20 is the ability to fine-tune the slat configuration to further accommodate physical alterations due to changes in weight and health. Compared to the unforgiving stiffness of a box spring or platform foundation, the slat suspension system has greater ability to respond specifically to every contour and weight. It substantially reduces the problems of sag, motion, or rollover found in conventional mattress/box spring combinations.

Different types of mattresses may be used with this mattress support system 20. However, it will be apparent that different types of mattresses will interact differently with the mattress support. One type of mattress that appears to work well with this mattress support system is a viscoelastic foam mattress as described above. As shown in FIG. 3, the viscoelastic mattress 40 comprises a top layer 42 of viscoelastic foam, and a core layer 44. These layers can be configured as discussed above. The viscoelastic layer 42 and the core layer 44 are attached together with a chemical adhesive and surrounded by a cover 46 to protect the mattress. The cover contains a zipper 48 for its removal from the mattress.

Shown in FIG. 5 is a cross-sectional view of an individual 52 lying on the bedding system 50. The viscoelastic mattress 40 compresses in response to the weight of the body, especially around the shoulders and hips when the person is lying on tier side. Similar compression occurs when the person is lying on their back. As shown, the slat-type mattress support 20 has been fine-tuned to deflect downwards in areas where the compression of the mattress is greatest, due to the downward deflection and rotation of the adjustable slats 16. This allows an even greater degree of flexibility around the shoulders and hips, complimenting the body-conforming and supporting properties of the viscoelastic mattress.

A bedding system composed of an adjustable slat-type mattress support and a body conforming viscoelastic mattress can be a great benefit not only to those with extreme body proportions, but also to people with mild to severe back pain. For example, people with specific back pain where a specific area of the back (e.g. the lumbar region) can be targeted to give greater support are particularly helped by such a system. By adjusting the mattress support to match a person's body shape and weight distribution, further flexibility can be provided to the viscoelastic mattress without reducing the density of the foam core.

Another problem in the prior art concerns the tendency of viscoelastic pillows to allow the head and neck to sag downward out of alignment with the spine. This is true for the general population, as well as neck patients under the care of a chiropractor or physical therapist. Many

chiropractors have complained that the tendency of these pillows to over-compress makes them undesirable. Not only do they not help maintain proper curvature of the cervical vertebrae following chiropractic manipulations, but in many cases they exacerbate the problem and contradict the treatments.

To address these problems, the inventors have developed a pillow that combines the advantages of shape-conforming viscoelastic foam with structure for increased support for the head and neck. As shown in Figs 6 & 7, the pillow 60 comprises a body 62 of viscoelastic foam, with a contoured top 64 and a flat bottom 66. There are two ridges on the contoured top – a larger ridge 68a for lying on one's side, and a smaller ridge 68b for lying on one's back. Disposed in the bottom 66 of the pillow under and parallel to each ridge 68 are two insert pockets 70a, 70b. Semicylindrical foam inserts 72 are configured to be inserted into the insert pockets to increase the support provided by the ridges. In one embodiment, the inserts are a half cylinder about 4 inches wide and about 2 inches thick. However, the height and width of the inserts can vary depending upon the size of the pillow. The viscoelastic foam pillow body and the inserts are surrounded by a cover 74 with an opening 76 to access the inserts.

The pillow body is preferably of the same 3510 viscoelastic foam described above, and thus provides the same advantageous temperature-related properties noted above. Consequently, the pillow body will not harden to the same extent as other viscoelastic materials at lower room temperatures. This can prevent excessive firmness in colder rooms, and thus prevent the creation of pressure points on the neck and possible neck pain. In one embodiment, the inserts 72 can comprise cutouts of the viscoelastic foam that are created when the insert pockets are cut out of the pillow body. Alternatively, the inserts can be of other materials, such as polyurethane foam, and can have a density that is greater than that of the viscoelastic foam, so as to increase the desired level of support. Inserts in a variety of densities may be used to adjust the firmness of the ridges 68. For example, a soft insert having an indentation force deflection (IFD) of 32 ±3 (i.e. IFD of 29-35) can be used. A medium insert having an IFD of 85 ±5 can also be used. Finally, a firm insert with an IFD at or above 120 can be used for greatest stiffness. Additionally, it will be apparent that the pillow could conceivably be used without any inserts, providing the softest possible configuration. The inserts are typically made of polyurethane foam, but can be any material with similar compression properties.

The inserts 72 used in the pillow 60 limit the amount of compression in response to the weight of the neck and head, thus keeping the head in proper alignment with the spine. Fine-tuning of the firmness of the pillow is accomplished by selecting inserts with different densities. Unlike traditional foam core pillows that tend to be too firm and raise the head too far, the

viscoelastic foam allows the head and neck to sink into alignment with the spine. However, the more dense inserts prevent the head from sinking too far on larger body builds, as with other memory foam pillows and many feather pillows. These properties allow optimal head-spine alignment, reducing neck discomfort and facilitating restful sleep. Fig 8 shows how the smaller ridge 68b with the foam insert 72 assists in keeping the proper curvature of the spine 84 when lying on one's back. Fig 9 shows how the larger ridge 68a with the foam insert 72 assists in keeping the spine straight when lying on one's side.

It is to be understood that the above-described arrangements are only illustrative of the application for the principles of the present invention. Numerous modifications and alternative arrangements can be devised without departing from the spirit and scope of the present invention. Thus, while the present invention has been shown in the drawings and fully described above with particularity and detail in connection with what is presently deemed to be the most practical and preferred embodiment(s) of the invention, it will be apparent to those of ordinary skill in the art that numerous modifications, including, but not limited to, variation in size, materials, shape, form, function and manner of operation, assembly and use may be made without departing from the principles and concepts set forth herein.